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Examining evidence of ‘shift-contagion’ in African stock markets: A CoVaR-copula approach

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Abstract

This paper examines for the first time contagion to African stock markets with particular attention to the quantification of, and testing for the impact of (extreme) downside movements in foreign exchange and developed stock markets on the (extreme) downside risks in Africa stock markets. Using data of weekly periodicity, the empirical analysis captured the pre, during (both turmoil and acute), and post periods of the 2007–2009 global financial crisis. We analyzed contagion by comparing (extreme) downside cumulative mean distribution conditional value-at-risk (CoVaR) values for African stock markets for successive periods and tested for significance of contagion using the Kolmogorov–Smirnov (KS) bootstrap technique. We used the KS statistic to test the hypothesis of equality or no systemic impact between the conditional African stock market return quantiles (for different successive sub-samples). CoVaR values are computed from four copula specifications — *Gaussian*, *Student-t*, *Gumbel* and *Rotated Gumbel*. By situating the empirical analysis within the shift-contagion thesis, we found evidence of contagion from some exchange rate and developed equity markets to African stocks only in the acute and the post-crisis periods. The findings are consistent with the view that global shocks propagation to developing markets may stagger during crisis and intensify post-crisis. A practical implication from the results is that given the relatively scarce resources and levels of technological know-how available to African governments, efforts to wean the continent’s equity markets from adverse effects of global market crashes should be geared towards plans and programmes to mitigate the shocks not at the early stages but latter stages, where the effects to Africa could be pronouncedly felt.

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1. Introduction

The financial crisis of 2007–2009 led to crashes in most equity markets across the globe. Not only did the crisis spark downturns in equity markets but also most foreign exchange markets of several developed and emerging markets witnessed dramatic movements (Celik, 2012). Contagion theorists believe that crashes in developed markets will obviously trigger tremors in emerging or developing markets. However, many analysts are of the opinion that emerging/developing markets will be insulated from the effects of turmoil in developed markets. The argument behind this belief is the touted “decoupling

theory”, which assumes that following the 2007–2009 crisis, the developed economy (e.g. U.S.) is no longer the driver of world economic growth but the developing and emerging market economies. Debates about Africa’s decoupling have largely centered on the global financial crisis (GFC) of 2007–2009. Reasons for believing Africa’s decoupling from developed and global shocks have mainly been attributed to the continent’s relatively less integrated economy and markets.

Contagion rallies the correlation of assets to unity, and lessens the rewards of portfolio diversification (Gulko, 2002). This view holds that crashes in developed markets or global economies lead to sell-offs in markets around the globe. This, the decoupling theory contradicts. The decoupling phenomenon holds that crashes in developed markets/economies do not necessarily result in losses in emerging markets; and that, emerging markets provide active diversification during GFCs. However, most studies (e.g. Pula and Peltonen, 2009; Dooley and Hutchison,

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2009) found no consistent evidence in endorsement of the decoupling view for emerging BRIC countries. Another implication of the decoupling theory is that the correlation of returns of emerging and developed equity markets, foreign exchange markets, as well as global commodities markets shifts from positive to negative in crisis periods. This suggests that returns from Africa and the developed markets, their currency markets, and global commodities markets are not jointly normal, annulling the Markowitz constant parameter mean-variance model. “The joint non-normality of returns has also been questioned in light of the market contagion that occurs during financial crisis” (Gulko, 2002: p. 64). However, critics of the decoupling phenomenon contend that to believe in the existence of decoupling is nothing but suggesting that the global economy is disconnected (Fitz-Gerald, 2010). Considering the uncertainty surrounding the joint non-normality assumption by the decoupling theory, it would be useful to test African markets decoupling from global shocks in order to ascertain whether African stocks can provide hedging and diversification avenues for investors seeking to diversify their portfolios pre, during, and after global crisis. Evidence in favour of shocks propagation would mean contagion and the absence of decoupling.

The case of Africa is notable to investigate due to the continent’s recent strengthening of economic links with developed countries (see Sugimoto et al., 2014). Further, with open market policies to international investors and increased efforts at overcoming barriers to international trade, investments in African economies have increasingly become attractive to foreign investors. Thus, making studies on contagion to African economies an interesting arena for both local and international investors. Unlike developed markets, studies exploring contagion effects to African equity markets appear very scanty. Daryl and Biekpe (2002) find evidence of contagion from the 1997 Asian crisis to South Africa, Egypt, Namibia, and Morocco. Further, Louis et al. (2009) indicate that the financial markets in Africa were affected by the contagious effects of the GFC; and that, the effects were enlarged by over-valued equities and inadequate diversification of same in the pre-crisis period. However, Forbes and Rigobon (2002) find no sign of contagion to South Africa. The view of Giovannetti and Velucchi (2013) is that while Kenya and Tunisia are “net creators” of volatility spill-overs from global markets to Africa; South Africa turns out to be a “net absorber”. In a related setting, Alagidede (2008) reveal that apart from South Africa, African markets respond to domestic rather than global information.¹

The aim of this paper is to examine whether (extreme) downturns in foreign exchange and developed equity markets spread to African stock markets? We investigate this aim within the framework of the Forbes and Rigobon (2002) shift-contagion theory (see details and distinction in subsequent sections). Of particular significance is the test of the theoretical validity of the shift-contagion and decoupling theories within Africa. If evidence is established against the shift-contagion theory it will

also mean that African stocks were decoupled from effects of the GFC.

The paper makes the following contributions to recent literature on contagion: first, extant studies have mainly examined contagion between only stock markets (example, Forbes and Rigobon, 2002; Daryl and Biekpe, 2002; Naoui et al., 2010; Hwang et al., 2010). This paper, among others, examines contagion between stocks and foreign exchange markets. Including foreign exchanges will enable us to ascertain whether foreign currency price risk command significant premium in African stock markets. Second, to the best of our knowledge, none of the studies on contagion has examined tail effects with particular attention to the quantification of, and testing for the impact of downside movements in foreign exchange and developed stock markets on the (extreme) downside risks in emerging stock markets. The paper by Reboredo et al. (2016) is however notable, even though it focuses on only extreme spillovers between stocks and currencies. The paucity of related studies on Africa is very disturbing. Meanwhile such downside contagion analysis is important for investors seeking to protect a diversified portfolio against adverse effects of extreme market movements. Further, our examination of contagion captures different phases of the GFC period — pre, phase I, phase II, and post.

The rest of the paper is structured as follows: Section 2 presents theoretical literature. Section 3 outlines data and research design. Sections 4 and 5 present results and conclusion, respectively.

2. Theoretical sketch — contagion

In spite of its popularity, ragging contentions abound on the precise definition of contagion in the financial economics literature. However, results of empirical findings on contagion would be meaningless unless theoretical and empirically relevant and better comprehension of the definition of contagion between and among markets is established. Common theoretical definitions of contagion in the literature are primarily based on the “pure” and “fundamental-based” concepts. The former asserts that contagion is said to occur when shock is transmitted from one country/market to another, without any idiosyncratic disorders and factors. On the other hand, the fundamental-based theory defines contagion as having occurred when shock transmission is propagated from one country/market to the other through the real sector (such as trade linkages or interdependence) or macro-economic factors. If for instance, returns (r) on a country’s (say i) equity markets are dependent on some set of economic factors (f) and a residual component or stochastic term, ε_i :

$$r_i = \delta_i + \lambda_i f + \varepsilon_i \quad (1)$$

then, on the assumption that the residual component (ε_i) in Eq. (1) shows significant correlations across markets, contagion may be deemed to have occurred, according to the fundamental-based theory (see Pritsker, 2000; Bekaert et al., 2005). Despite the dominance of the fundamental-based theory over the pure one, the former has come under severe criticisms. Pritsker (2000) argues that, the fundamental-based definition is flawed on two

¹ See also Boako and Alagidede (2017).

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